ATTACHMENT 3-1
DTTF WASTE ANALYSIS PLAN

1.0 INTRODUCTION: 40 CFR 270.14(b)(3); R315-3-5(b)(3)

This attachment to the Dugway Resource Conservation and Recovery Act (RCRA) permit describes the plan for analyzing waste at the Dugway Thermal Treatment Facility (DTTF). This attachment is organized into the following sections:

- Analysis and Management of Propellant, Explosive and Pyrotechnic (PEP) Wastes to be Treated at The DTTF; and
- Analysis and Management of Wastes Resulting From DTTF Operations.

2.0 ANALYSIS AND MANAGEMENT OF PEP WASTES TREATED BY THE DTTF: 40 CFR 270.14(b)(3), 264.13(b); R315-3-5(b)(3), R315-8-2.4

Characterization of PEP waste is described in Section 2.1. Waste acceptance for treatment at the DTTF is described in Section 2.2.

2.1 WASTE CHARACTERIZATION: 40CFR 270.14 (b)(2), 270.23(d), 264.13 (a); R315-8-2.4, R315-3-5 (b) (2), R315-3-6(a)(8)(iv)

As part of its military mission, DPG may be required to thermally treat any munition in the U.S. inventory plus foreign and test munitions that have been declared wastes. The Army considers PEP materials and munitions to be wastes when:

- An item no longer meets appropriate military standards (e.g., exceeded shelf life, excessive rust on an item, etc.);
- An item has been declared surplus and cannot or has not been sold or recycled;
- An item has been declared unsafe for storage or transport off the installation (e.g., munitions which have undergone drop tests, shaking tests, or have been thermally challenged); and/or
- An item is unexploded ordnance from testing or training (including munitions which did not release properly from aircraft) which are determined by range clearance personnel to be stable enough to safely remove from the point of impact and transport to the DTTF for treatment.

PEP wastes must be characterized prior to submittal to the DTTF for thermal treatment. For safety reasons, waste characterization data for PEP wastes is not obtained from sampling and analysis. Information that can be used to characterize waste munitions may be obtained from many sources including:

- Historical data or user knowledge,
- Munitions specifications,
- U.S. Army Technical Manual (TM), 43 Series & 60 Series,
- Army Ammunition Data Sheets, and
- Munitions Items Disposition Action System (MIDAS) database.

Munitions that have been treated at the DTTF from 2002 through 2004 are listed in Tables 1 and 2. These library tables also list the munitions total weight, net explosive weight, type(s) of explosives used, and other known hazardous constituents. Before treating munitions that are not listed in the tables, the total weight, net explosive weight, type(s) of explosives used, and other known hazardous constituents will be documented. If definitive information is not known or cannot be discovered about a particular munition, or an item is truly an unknown munition, it will not be treated at the DTTF without an emergency permit.

Table 1.
Munitions Treated at the DTTF by Open Burning, 2002 Through 2004

Munition	Total Weight lbs.	Net Explosive Weight lbs.	Type(s) of Explosive	Other Hazardous Constituents
Cartridge. Cal .50 AP M2 1305-00-028-6294	.259	.03388	Propellant IMR 5010 233.00gr Primer Mix 2.25gr	Metals and other non-metal constituents (See TRI)
Charge Propelling M67 1315-00-825-1384	2.9	2.825	Propellant M1	Metals and other non-metal constituents (See TRI)
TRI – Toxic Release Inventory				

Table 2.
Munitions Treated at the DTTF by Open Detonation, 2002 Through 2004

Munition	Total Weight lbs.	Net Explosive Weight lbs.	Type(s) of Explosive	Other Hazardous Constituents
Cartridge. 105MM HE M1 W/PD Fuze 1315-00-028-4841	42	7.45	Comp B	Metals and other non-metal constituents (See TRI)
Cartridge. 105MM HE M1 W/PD Fuze 1315-00-028-4832	42	7.45	TNT 4.6lbs Prop M1 45.2oz Supp Chg Comp 0.30lb PB Azide 8.28gr Tetryl 5.01gr Primer Mix 0.86gr Black Powder 0.32gr Primer Mix #70 0.17gr	Metals and other non-metal constituents (See TRI)
Cartridge. 60MM HE M720 1310-01-022-7680	3.75	0.8869	Comp B	Metals and other non-metal constituents (See TRI)
Cartridge. 81MM Practice M879 W/PD Fuze Prac M751 1315-01-354-4916	9.4	0.3629	Prop M38 535gr Charge Pyrotechnic 16gm Prop Flake M9 115.0gr Pellet 3.12gr Primer Mix #70 0.37gr	Metals and other non-metal constituents (See TRI)

Table 2.
Munitions Treated at the DTTF by Open Detonation, 2002 Through 2004

Munition	Total Weight lbs.	Net Explosive Weight lbs.	Type(s) of Explosive	Other Hazardous Constituents
Cartridge. 60MM Illumination M721 W/FZ MTSQ M776 1310-01-258-8689	3.76	0.68	Illumination Comp 260.0gm First Fire Comp 17.0gm Prop M10 125.0gr Prop M952.0gr Primer Mix #70 0.37gr	Metals and other non-metal constituents (See TRI)
Carge Demo M183 1375-00-926-3985	23.0	20.0	Comp C41.25lb PETN 0.01lb RDX 13.56gr	Metals and other non-metal constituents (See TRI)
Primer Percussion MK2A4 1390-00-009-5571	0.025	0.0028	Black Powder 19.0gr Pellet Booster 0.60gr	Metals and other non-metal constituents (See TRI)
Fuze ET M762 1390-01-282-6038	1.1	0.00055	PBX 168.0mg HMX 16.0mg PB Azide 14.0mg Smokeless Powder 7.0mg Spot Charge 0.80mg	Metals and other non-metal constituents (See TRI)
Cartridge. IGN M299 1315-01-050-8883	0.141	0.017	Prop M9 Flake 115.0gr Pellet 3.12gr Primer Mix #70 0.37gr	Metals and other non-metal constituents (See TRI)
Fuze PD M557 1390-00-187-5392	2.12	0.030	Pellet Booster 351.0gr PB Azide 8.28gr Tetryl 1.23gr Primer Mix 0.86gr Black Poeder .32gr Primer Mix #70 9.17gr	Metals and other non-metal constituents (See TRI)
Repair Kit Ctg. 81MM M8801315-01-219-3936	1.05	0.36710	Charge Pyrotechnic 169.76gr Prop Doublebase 85.5gr Primer Mix 0.88gr Primer Mix 0.48gr	Metals and other non-metal constituents (See TRI)

2.2 WASTE INSPECTION AND ACCEPTANCE: 40 CFR 270.14 (b)(3), 264.13(b); R315-3-5(b)(3), R315-8-2.4

Facility personnel must ensure that only permitted wastes are treated at the DTTF. Permitted wastes include:

- Excess munitions and explosive materials (e.g. bulk explosives, small arms munitions, projectiles, flares, grenades, sub-munitions, bombs and rocket motors),
- Excess solid propellant components and associated residues, and
- Explosive residues generated by Dugway testing facilities and laboratories.

Prohibited wastes include any waste from sources, classes, or compositions other than those identified above including:

- Wholly inert items,
- Armor penetrating weapons containing depleted uranium,
- Chemical and nuclear weapons, their devices and components, and
- Excess packaging materials such as inner packing.

Incoming waste must be inspected to ensure that only permitted waste types and amounts are treated. Prior to treatment at the DTTF, the following information is obtained and documented:

- Source of the waste,
- Type of waste,
- National stock numbers or other identifying information,
- Net explosive weight (NEW), including donors and initiators, of waste to be treated, and
- Gross weight of waste to be treated.

When receiving waste energetic material from off-site, all formal requests for treatment and associated correspondence (a formal treatment request from the generator) must be referenced to each uniform hazardous waste manifest. This information shall be kept in the operating record.

3.0 ANALYSIS AND MANAGEMENT OF WASTE RESULTING FROM DTTF OPERATIONS: 40 CFR 270.14(b)(3), 264.13(b); R315-3-5(b)(3), R315-8-2.4

The purpose of this section is to describe how information is gathered that will aid in characterizing the residue remaining after DTTF treatment as well as the subsequent handling, storage, and treatment of this residue.

The open burning (OB) of explosive materials may generate residual ash and scrap metal. Upon completion of an OB, the residual ash in the burn pan is allowed to cool. The cooling process typically takes less than 24 hours; however, the burn pan cover is replaced within 30 minutes after the completion of the burn to prevent wind scattering of the ash. The interior of the burn pan and the soil in the immediate vicinity of the pan are visually inspected for the presence of unburned PEP waste. Since 1987, when OB was first conducted in a burn pan, the process has always resulted in complete demilitarization of the treated PEP waste. Although the demilitarization of the PEP waste is complete, the residual ash remaining in the burn pan or on the ground shall be handled as a hazardous waste until it can be proven to be non-hazardous.

The residual ash is removed from the burn pan (and, if applicable, the ground surface surrounding the pan) using non-sparking brushes and shovels and is placed in plastic bags or small steel ammunition cans. The ash may then be placed in a satellite accumulation container located in one of the DTTF portable ammunition magazine.

When the amount of accumulated ash reaches the fill limit of the satellite accumulation container, a sample is taken using the approved procedures outlined in Section 3.2. As specified in 40 CFR 261.3(c)(2), ash generated from the treatment of a characteristically hazardous waste is a hazardous waste unless it can be shown that it does not exhibit the characteristics of a hazardous

waste in accordance with 40 CFR Part 261.3(d)(1). The residual ash will be analyzed for the parameters discussed in Section 3.1. Residues that are verified as hazardous waste are disposed of at an off-site RCRA-permitted hazardous waste disposal facility. Residues that are not hazardous are disposed of either on- or off-site as solid waste.

Precipitation may occasionally accumulate in burn pans creating potentially hazardous waste. Any precipitation discovered during site inspections (see Attachment 3-3) will be transferred to an approved Department of Transportation (DOT) container as soon as possible. The containerized water will be sampled and analyzed in accordance with Sections 3.1 and 3.2 to determine if it is to be managed as a hazardous or non-hazardous waste.

Dugway protocol for treatment of PEP waste by open detonation (OD) calls for Dugway personnel to size and place an initiating charge such that it will ensure complete vaporization of both the PEP waste and the initiating charge. However, detonation events may generate pieces of unexploded PEP materials (such as primers and detonators) and/or pieces of scrap metal.

A visual inspection, in accordance with the procedures in Attachment 3-3, shall be conducted of the detonation area after treatment by OD. If the inspection reveals pieces of munition, including scrap metal, which are still contaminated with PEP, the PEP waste will be retreated by OD within 24 hours. Since the amount of waste which has not been completely treated is expected to be only a fraction of the original amount treated, the weight limitation for treatment by OD should not be exceeded. Scrap metal that is not contaminated with PEP is placed in a drum or other container for recycling.

3.1 PARAMETERS AND RATIONALE: 40 CFR 264.13(b)(1); R315-8-2.4

Ash resulting from the treatment of PEP hazardous wastes may require tests to determine other hazardous waste characteristics. Residual ash is not reactive but may contain RCRA-listed metals. As soon as it is safe to do so, the ash is containerized. Before disposal, the accumulated ash is sampled and analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) metals listed in Table 3. If the laboratory analysis indicates the ash contains hazardous levels of RCRA-listed metals, the containers are removed to a permitted hazardous waste disposal facility meeting the land disposal requirements of 40 CFR Part 268. If the analytical results indicate that the ash does not contain hazardous levels of RCRA-listed metals, the ash is managed as solid waste.

Table 3.
Preferred Analytical Methods, Sample Containers, and Holding Times for DTTF Hazardous Wastes.

Determination	Method Reference[1]	Container[2]	Preservative	Recommended Maximum Holding Time
OB Ash				
TCLP Metals (As, Ba, Cd, Cr, Pb, Se, Ag)	EPA 1311/6010B	Teflon® or Glass	None required	TCLP: 180 days Analyze: 180 days
TCLP Mercury	EPA 1311/7470A	Teflon® or Glass	None required	TCLP: 28 days Analyze: 28 days

Table 3.
Preferred Analytical Methods, Sample Containers, and Holding Times for DTTF Hazardous Wastes.

Determination	Method Reference[1]	Container[2]	Preservative	Recommended Maximum Holding Time
OB Rainwater				
Total Metals (As, Ba, Cd, Cr, Pb, Se, Ag)	EPA 6010B	Plastic	Nitric Acid to pH < 2	Analyze: 180 days
Total Mercury	EPA 7470A	Plastic	Nitric Acid to pH < 2	Analyze: 28 days

[1] Methods listed as from "Test Methods for Evaluating Solid Waste," SW-846. Equivalent methods may be used if approved by the UDSHW.
[2] Container for solid samples is generally 4-6 ounce clear wide-mouth glass jar.
EPA U.S. Environmental Protection Agency
TCLP Toxicity Characteristic Leaching Procedure [Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Selenium (Se), and Silver (Ag)]

Analysis for TCLP metals is performed to determine if the ash resulting from the thermal treatment of waste explosive materials should be classified as hazardous waste. Metals are chosen because some PEP have metal constituents and munition housings are typically composed of various metals. In addition, metals may not fully volatilize during thermal treatment. TCLP semi-volatile and volatile analyses will not be performed because they are highly unlikely to remain in residual ash. TCLP herbicides and pesticides are not expected due to the nature of the PEP. The TCLP toxicity of the ash is variable with the type and chemical composition of the treated explosives.

Accumulated precipitation has the potential to leach metals from any ash residue remaining in the burn pans. Collected rainwater will be analyzed for total metals to determine if the concentrations exceed discharge limits. Rainwater exceeding the discharge limits will be managed as hazardous waste.

3.2 SAMPLING METHODS: 40 CFR 264.13(b)(3) and 261 Appendix I; R315-8-2.4

The sampling equipment, collection, and handling methods used for new, unknown, process changes, or re-verification of wastes generated at the DTTF, follow general EPA sampling protocols such as those contained in the most recent edition of the United States Environmental Protection Agency (EPA) document Test Methods for Evaluating Solid Waste, SW-846. The following general sampling procedures and precautions are followed:

- Appropriate safety equipment (e.g., gloves and safety glasses) are worn during sampling. This requirement varies based on the specific chemical properties of the waste and the circumstances under which it is being sampled;
- Only non-sparking equipment is used during sampling; and
- All necessary sampling equipment is within reach of the sampler before the sample is collected.

The ash or other residues will be sampled using clean sampling equipment following specified methods described in SW-846. Specific samples will be collected based on the following methodology:

- Using a scoop (stainless steel, Teflon-lined or disposable plastic) transfer grab-samples of ash waste into an appropriate-sized glass or plastic sample container. Sample size is determined by the amount required for the analytical method(s) (typically 500 g is collected). Immediately seal the sample container after sample collection. Sample seals are used to preserve the integrity of the samples from the time they are collected until they are opened in the laboratory.

- Collected rainwater will be sampled using a COLIWASA or other acceptable sampling device. Sample size is determined by the amount required for the analytical method(s). Immediately seal the sample container after sample collection. Sample seals are used to preserve the integrity of the samples from the time they are collected until they are opened in the laboratory.

- Record sampling information on the sample container and chain-of-custody record. All sample labels will be marked with the following information using indelible ink:
    - Name of the sampler,
    - Date and time of collection,
    - Sample collection location, and
    - Sample identifier that uniquely identifies the sample.

- Record the following information, at a minimum, on the chain-of-custody record:
    - Unique sample identification,
    - Sample collection location,
    - Date and time of collection,
    - Sample type (grab or composite),
    - Sample description (waste type),
    - Analyses to be performed, and
    - Signatures of the personnel involved in the custody of the samples.

Samples will be delivered to the laboratory as soon as practical. The chain-of-custody accompanies the samples. Samples are properly packaged to avoid leakage or breakage during shipment.

Sampling devices and containers are cleaned before use. All used non-disposable containers and samplers are washed with warm detergent solution, rinsed at least three times with tap water, rinsed with distilled water, and air dried or wiped dry. All clean samplers, containers, etc., are placed in clean plastic bags and sealed. The cleaned and packaged equipment is stored in an appropriate area away from all new sampling equipment.

3.3 ANALYTICAL METHODS: 40 CFR 264.13(b)(2); R315-8-2.4

Analyses should be performed by a laboratory certified by the State of Utah. Approved analytical methods are those found in the SW-846. Recommended test procedures are listed in Table 3.

3.4 FREQUENCY OF ANALYSIS: 40 CFR 264.13(b)(4); R315-8-2.4

The residual ash from treatment in the burn pans will be placed in a satellite accumulation container. Ash can be added to the satellite accumulation container until it reaches the fill limit (55 gallons). One sample from each drum of ash will be collected and analyzed prior to disposal.

3.5 PROCEDURES FOR WASTE TO BE DISPOSED OF OFF-SITE: 40 CFR 264.13(b)(5); R315-8-2.4

All DTTF hazardous wastes shipped to off-site landfills will be non-reactive and meet the requirements of 40 CFR Part 268.

3.6 PROCEDURES FOR WASTE GENERATED OFF-SITE: 40 CFR 264.13(c); R315-8-2.4

All wastes accepted for treatment at the DTTF must meet the criteria described in Section 2.2. All hazardous waste ash and debris generated by DTTF operations is generated on-site.

3.7 PROCEDURES FOR THE PROPER HANDLING OF IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES: 40 CFR 264.13(b)(6) and 264.17(c); R315-8-2.4

The information provided in this section is submitted in accordance with the regulatory requirements of 40 CFR 270.14(b)(9). PEP materials handled at the DTTF are assumed to be reactive. As such, personnel must take appropriate precautions to prevent reactions which:

- Generate extreme heat, pressure, fire, or explosions, except during thermal treatment,
- Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment,
- Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion,
- Damage the structural integrity of the burn pans, and
- Threaten human health or the environment through other means.

The means to accomplish the aforementioned criteria are provided through the establishment of safety guidelines incorporated in the standing operating procedure (SOP) for the DTTF DP-0000-H-100 (Thermal Treatment, Dugway Thermal Treatment Facility (DTTF): Munitions, Bulk Propellant, and Explosives). The safety guidelines include, but are not limited to, the following:

- Ignition sources shall be prohibited at the DTTF, except as required to initiate thermal treatment;
- Spark-producing equipment and tools shall be prohibited from use near explosive materials unless specifically authorized;
- Incompatible materials shall not be treated or stored in the same location;
- Supervisors shall perform inspections of hand tools and mechanical devices to ensure that they have not become unsafe for their designated use;
- Motor vehicles used to transport waste explosives, ammunition, or other material to the DTTF shall meet the requirements AMC-R-385-100, Chapter 22; and
- Thermal treatment operations shall not be conducted during electrical storms.

3.8 COMPATIBILITY OF WASTE AND CONTAINER: 40 CFR 264.172 through 264.177; R315-8-9.3 through R315-8-9.8

Explosive hazardous waste shall only be stored in the original containment device or in Army/Department of Defense approved containers. Residual ash shall be stored in containers that are compatible with ash. If there is any indication that the ash and container may not be

compatible with each other, a polyethylene liner may be used in the waste drum. This will ensure that adverse reactions do not occur.

3.9 REQUIREMENTS FOR RESTRICTED LAND DISPOSAL OF HAZARDOUS WASTE: 40 CFR 268; R315-13-1

Waste explosives are characteristically hazardous waste due to reactivity (hazardous waste code D003). Therefore, they must be treated to remove the characteristic prior to land disposal. The appropriate treatment technology for reactive waste is deactivation. Therefore, the generators of the explosive waste must notify the treatment facility of the appropriate treatment for their waste. The notification sent by the generator must include the applicable requirements described in 40 CFR Part 268.7(a)(1). Because the generator has to determine if the wastes are restricted from land disposal, the generator must maintain documentation of that determination (40 CFR Part 268.7(a)(5)) and copies of the land disposal notification sent to the treatment facility.

Waste explosives treated by thermal treatment no longer retain the D003 waste code because the treatment renders the material non-reactive. However, the residual ash may contain metal constituents. Therefore, the residual ash is tested for TCLP metals to determine if the ash may be land disposed without further treatment.

If the ash does not contain any TCLP constituents above the regulatory levels in 40 CFR Part 261.24, the ash may be sent by the treatment facility to the land disposal facility with a certification in accordance with 40 CFR Part 268.7(b)(5) stating that the waste was treated in accordance with the treatment technology standards.

If the ash contains any TCLP constituents above the regulatory levels in 40 CFR Part 261.24, it must be treated prior to land disposal. In this case, the treatment facility becomes the generator of the ash waste. Therefore, the ash must be sent along with a notification of appropriate treatment standards to the treatment facility as discussed above.

For reactive wastes, once the waste is no longer hazardous, a one-time notification and certification in accordance with 40 CFR Part 268.9(d) must be placed in the generator and treatment facility files and also be submitted to the State of Utah. Therefore, if the waste generation and treatment process do not change and the waste is always sent to the same disposal facility, the State of Utah does not require notification and certification with every shipment of waste. The disposal facility and the shipper will require appropriate paperwork with every shipment.

4.0 DTTF TREATMENT EFFECTIVENESS: 40 CFR 264.602 AND 270.23(d) AND UAC R315-8-16 AND R315-3-6.8(d)

At the present time, thermal treatment of PEP and PEP-contaminated wastes is the fastest, safest, most reliable, least expensive, and most efficient means of destruction and can be done in a manner that is protective of both human health and the environment. In addition, OB and OD procedures are well understood by Dugway munitions specialists and their experience aids in the maximization of the effectiveness of these treatment procedures. By contrast, other demilitarization alternatives have given varying results, in terms of environmental impact, and are more difficult to implement.

4.1 HAZARDOUS WASTE TREATMENT

The objective of each OB or OD event is to completely treat the reactive components of a waste munition item, or group of items. Maximum treatment effectiveness is achieved by trained DTTF personnel following procedures developed through years of experience handling military munitions. Their skill and competence in treating ordnance thus represent the first level used to ensure maximum treatment effectiveness is achieved. Application of these skills, compliance with the SOPs, and avoidance by DTTF personnel of certain adverse climatic events, such as high winds, rain, or electrical storms, has been proven to provide desirable results for OB or OD treatment operations. Following all treatments by OB and/or OD, DTTF personnel inspect the area encircling the treatment site to determine the effectiveness and completeness of the operation.

Properly conducted DTTF activities do not negatively impact human or ecological receptors, as indicated in both the supporting human health and ecological risk assessments. Ash resulting from OB activities can contain hazardous levels of some metals and require proper management as described in Section 3.1. Studies have indicated that OD activities have not significantly impacted the DTTF area (see Kleinfelder 1993) above risk-based levels although metals are considered potential contaminants. Dugway will continue to collect and analyze DTTF soil samples to verify continued treatment effectiveness (see Attachment 3-9, Section 3.9).

4.2 DTTF TREATMENT EMISSIONS

Information regarding the decomposition products of explosives has been obtained from a variety of studies. These include analysis of DTTF range soils, analysis of snow in the vicinity of DTTF events, analysis of the atmosphere resulting from detonations in small steel chambers, and analysis of the atmosphere resulting from burning or detonation conducted in a large, flexible airtight chamber called a BangBox®. These studies show groundwater unconfined detonation converts explosives primarily into CO_2, N_2, and H_2O with small quantities of saturated, unsaturated, and aromatic hydrocarbon compounds. The effect of these emissions on receptors at Dugway is considered negligible as discussed in the DTTF ecological risk assessment as approved in February 2007 and the human health risk assessment submitted in May 2007.

5.0 REFERENCES

Dugway Proving Ground, Standing Operating Procedure– Thermal Treatment, Dugway Thermal Treatment Facility (DTTF): Munitions, Bulk Propellants, and Explosives, DP-0000-H-10, May 2007.

US Environmental Protection Agency (EPA), SW-846, Test Methods for Evaluating Solid Waste, http://www.epa.gov/epaoswer/hazwaste/test/main.htm

Kleinfelder 1993. Soil and Groundwater Investigation Open Burn/Open Detonation Site Dugway Proving Ground, Utah. August 6, 1993.